



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/727,516	12/04/2000	Jeong-Jin Kim	3430-149P	5548

7590 03/01/2006
BIRCH, STEWART, KOLASCH & BIRCH, LLP
P.O. Box 747
Falls Church, VA 22040-0747

EXAMINER

ALANKO, ANITA KAREN

ART UNIT PAPER NUMBER

1765

DATE MAILED: 03/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/727,516	Applicant(s) KIM ET AL.	
	Examiner Anita K. Alanko	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 2/6/06 amdt.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 4-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 4-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 2/6/06 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over admitted prior art in view of Yates (US 6,350,322 B1).

Admitted prior art discloses a method comprising:

introducing an etching solution (10b, Fig.1) into the vessel 10 from below the objects;

etching the objects with the etching solution;

cleaning the objects by introducing a cleaning solution 10c into vessel from below the objects (Fig.1); and

draining the cleaning solution from the vessel from above the objects (through first draining pipe 10d).

Admitted prior art fails to disclose to introduce pressurized gas into the vessel from above the objects.

Yates teaches a method comprising:

forcing out (wet) etching solution from the vessel and providing pressurized gas into the vessel (col.11, lines 15-25, the “purging step” and “forming an inert gas atmosphere” step).

Yates does not explicitly disclose in column 11 how the etching solution is displaced from the vessel.

In the second embodiment in which etching, cleaning and drying are all done in the same chamber, Yates teaches (col.12, lines 26-30):

25 ~~embodiment.~~

In a second embodiment of the present invention, the chemical treatment is an HF gas etch, by way of non-limiting example. Other etching may be carried out, such as wet or dry etching. Following the chemical treatment, a DI
30 water rinse followed by drying is carried out. Single-

The embodiment is primarily directed to dry etching, so there is no description of how a wet etchant would be drained from the apparatus. However, Yates discloses in the claims that after wet etching, that inert gas is supplied to the chamber (col.11, lines 15-26):

23. A method of cleaning a semiconductor structure 15 comprising:

performing a chemical reaction wet etching upon said semiconductor structure within a single compartment of an at least substantially enclosed vessel;

purging the single compartment of said vessel with a gas; 20

forming an inert gas atmosphere in the single compartment of said vessel, said gas forming said inert gas atmosphere being inert to said semiconductor structure and to said vessel;

contacting said semiconductor structure with DI water; 25

Yates teaches that the inert gas atmosphere, such as nitrogen gas, avoids unwanted oxidation or other contamination incident to ambient air exposure that may occur during or after rinsing (col.5, lines 4-6, 13-14).

After wet etching, the chamber is purged and then cleaning is conducted. There is no intermixing of the etching solution and the cleaning solution, and thus no change in the density of either the etching solution or the cleaning solution. Rather, inert gas is introduced that is inert to the semiconductor structure.

After providing an inert gas atmosphere, cleaning is conducted (the “contacting... with DI water” step). Thus Yates does not explicitly disclose how the wet etching solution is displaced from the chamber. However, it would have been obvious to one with ordinary skill in the art that the wet etchant is drained from the chamber in the same manner, i.e. from below the object, as a cleaning solution because otherwise the apparatus would have to be redesigned to provide a different manner for draining the wet etchant, which costs time and money.

It would have been obvious to one with ordinary skill in the art to force the wet etchant out by introducing a pressurized gas in the method of Yates because the next step in the method of Yates is to introduce a gas, and it would save time and money to introduce the inert gas while the wet etchant is draining rather than to wait. Alternatively, since wet etching does not occur within a vacuum, some atmosphere or gas is inherently present in the wet chamber during draining of the wet etchant.

Yates does not explicitly disclose that draining of etchant from the wet etch chamber occurs by introducing a pressurized gas from above the objects to force the etching solution out

from below the objects. However, this is suggested because Yates does disclose this in order to drain the cleaning solution from the gas etch chamber (col.6, lines 56-60):

The method of draining the gas etch chamber by displacing the DI water bath with a gas or a vapor, or both, can be accomplished by installing an effluent valve, as seen in FIGS. 1-3, in the gas etch chamber at a level below the 60 lowest portion of the semiconductor structure. A preferred

It would have been obvious to one with ordinary skill in the art to drain the etching solution from the wet etch chamber by introducing a pressurized gas from above the objects to force the etching solution out from below the objects in the method of Yates because Yates teaches that this is useful for draining the wet cleaning solution, and in order to save time and money, it would be useful to use this same method to drain other wet solutions such as wet chemical etching solutions.

It would have been obvious to one with ordinary skill in the art to introduce a pressurized gas into the vessel from above the objects to force the etching solution out of the vessel from below the objects in the method of admitted prior art as taught by the modified method of Yates because Yates teaches that this is a useful manner to do so and introducing gases reduces unwanted oxidation and contamination of substrates, which increases the yield of the final product.

As to claim 5, the method of admitted prior art suggests to use pipes 10d for draining the cleaning solution and pipe 10e for draining the etching solution. Still further, apparatus limitations are given little weight in method claims. Apparatus limitations, unless they affect the process in a manipulative sense, may have little weight in process claims. *In re Tarczy-Hornoch* 158 USPQ 141, 150 (CCPA 1968); *In re Edwards* 128 USPQ 387 (CCPA 1961); *Stalego v.*

Heymes 120 USPQ 473, 478 (CCPA 1959); *Ex parte Hart* 117 USPQ 193 (PO BdPatApp 1957); *In re Freeman* 44 USPQ 116 (CCPA 1940); *In re Sweeney* 72 USPQ 501 CCPA 1947).

In addition, it would have been obvious to use different draining pipes so that the etching solution is capable of being regenerated and reused, which saves time and money, rather than being mixed with the cleaning solution.

As to claim 6, Yates does not disclose the gas used for purging. However, Yates does teach that nitrogen is a useful gas for filling vessels because it is inert to both the semiconductor structure and the vessel (col.5, lines 6-16). This in turn would increase the final yield by reducing contamination of the final product. It would have been obvious to one with ordinary skill in the art to use nitrogen in the method of admitted prior art because Yates teaches that it is inert to the object and to the vessel, which reduces contamination.

As to claim 7, Yates discloses to use HF, not oxalic acid. However, oxalic acid is a well known oxidizing agent. It would have been obvious to one with ordinary skill in the art to use oxalic acid as a treatment liquid in the method of Yates because it is a conventional treatment liquid for semiconductor structures.

As to claim 8, Yates discloses deionized water (col.11, lines 33-34), which is obvious to use in the method of admitted prior art because it is a useful cleaning solution.

As to claim 9, it would have been obvious to one with ordinary skill in the art to use a pump to enhance the step of forcing out the etching solution because pumps are conventional to drain liquids. Further, apparatus limitations, unless they affect the process in a manipulative sense, may have little weight in process claims. *In re Tarczy-Hornoch* 158 USPQ 141, 150 (CCPA 1968); *In re Edwards* 128 USPQ 387 (CCPA 1961); *Stalego v. Heymes* 120 USPQ 473,

478 (CCPA 1959); *Ex parte Hart* 117 USPQ 193 (PO BdPatApp 1957); *In re Freeman* 44 USPQ 116 (CCPA 1940); *In re Sweeney* 72 USPQ 501 CCPA 1947).

As to claims 10-11, admitted prior art discloses drying with IPA (through 10a).

As to claim 12, it would have been obvious to clean after purging the etching solution by introducing the gas because Yates teaches that it is useful to clean after etching and after introducing the gas.

As to claims 13-20, see the rejection of claims 4-12.

Response to Arguments

Applicant's arguments filed 2/6/06 with respect to claims 4-20 have been considered but are moot in view of the new ground(s) of rejection.

Applicant argues that the conclusion by the examiner that a wet etching solution would be drained in the same manner as the DI water is improper because it completely fails to provide any objective evidence supporting the allegation. This is not persuasive because the chamber would have to be redesigned to find an alternative means to exit or drain the wet etchant if the same means for exiting the wet etchant and the cleaning solution is not used. Since this is not disclosed by Yates, it is expected that it would be drained in the same manner as the cleaning solution since they are both liquid solutions.

Examiner acknowledges that Yates does not disclose how to drain the etching solution. However, this is obvious as discussed above in the rejection.

In the interview between applicant's representatives and the examiner on February 25, 2006, an amendment about the density of the solutions was discussed. However, after further

Art Unit: 1765

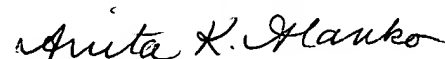
consideration, this is not deemed allowable because since the same method steps are conducted as in the instant invention, the same results about density differences are expected.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anita K. Alanko whose telephone number is 571-272-1458. The examiner can normally be reached on Mon-Fri until 2:30 pm (Wed until 11:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Anita K Alanko
Primary Examiner
Art Unit 1765